

FORM PTO-1390  
(REV 10-97)

U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

**TRANSMITTAL LETTER TO THE UNITED STATES  
DESIGNATED/ELECTED OFFICE (DO/EO/US)  
CONCERNING A FILING UNDER 35 U.S.C. 371**

DATE: April 24, 2000

EXPRESS MAIL LABEL NO.  
EL496226070USATTORNEY DOCKET NO.  
37395/DBPU.S. APPLICATION NO.  
TO Be Assigned  
**09/530145**INTERNATIONAL APPLICATION NO.  
**PCT/JP98/04702**INTERNATIONAL FILING DATE  
**19.October.1998**PRIORITY DATE CLAIMED  
**24.October.1997**

TITLE OF INVENTION

**COMMUNICATION GATEWAY DEVICE**APPLICANT(S) FOR DO/EO/US  
**Toshio Yamawaki**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to begin national examination procedures (35 U.S.C. 371(f) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2)).
  - a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☒ has been transmitted by the International Bureau.
  - c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/LUS).
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. ☐ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)).
  - a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
  - b. ☐ have been transmitted by the International Bureau.
  - c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
  - d. ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

**Items below concern other document(s) or other information included:**

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☒ A FIRST preliminary amendment.  
☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☐ Small entity claim with a copy of this transmittal letter attached.
17. ☒ International search report.
18. ☒ International preliminary examination report.
19. ☒ Extra set of Drawings
20. ☒ English Translation of of International Application with English Translation of Annexes to IPER Incorporated
21. ☐

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U.S. APPLICATION NO. <b>09/530145</b> To Be Assigned		INTERNATIONAL APPLICATION NO. <b>PCT/JP98/04702</b>		ATTORNEY DOCKET NO. <b>37395/DBP</b>	
<input checked="" type="checkbox"/> The following fees are submitted: (see Note (1) below)				CALCULATIONS	PTO USE ONLY
<b>Basic National Fee (37 CFR 1.492(a)(1)-(5)):</b>					
Search Report has been prepared by the EPO or JPO..... \$ 840.00					
International preliminary examination fee paid to USPTO (37 CFR 1.482) ... \$ 670.00					
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))..... \$ 690.00					
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO..... \$ 970.00					
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)..... \$ 96.00					
<b>ENTER APPROPRIATE BASIC FEE AMOUNT =</b>				<b>\$ 840.00</b>	
Surcharge of \$130 for furnishing the oath or declaration later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(e)).				\$	
Claims	Number Filed	Number Extra	Rate		
Total Claims	9 <sup>2</sup> -20=	0	X \$18	\$ 0.00	
Independent Claims	6 -3=	3	X \$78	\$ 234.00	
Multiple dependent claim(s) (if applicable)			+ \$260	\$ 260.00	
<b>TOTAL OF ABOVE CALCULATIONS =</b>				<b>\$ 1,334.00</b>	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small entity statement must also be filed. (Note 37 CFR 1.9, 1.27, 1.28).				\$	
<b>SUBTOTAL =</b>				<b>\$ 1,334.00</b>	
Processing fee of \$130 for furnishing the English translation later than <input type="checkbox"/> 20 <input type="checkbox"/> 30 months from the earliest claimed priority date (37 CFR 1.492(f)).				\$	
<b>TOTAL NATIONAL FEE =</b>				<b>\$ 1,334.00</b>	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property				\$ 40.00	
<b>TOTAL FEES ENCLOSED =</b>				<b>\$ 1,374.00</b>	
<b>Note (1): The basic national fee must be paid when filing this application. The 20-month time limit (37 CFR § 1.494) and 30-month time limit (37 CFR § 1.495) are not extendable.</b>				Amount to be:	
				refunded	\$
				charged	\$
a. <input checked="" type="checkbox"/> A check in the amount of \$ <u>1,334.00 (filing fee) and \$40.00 (recording fee)</u> to cover the above fees is enclosed.					
b. <input type="checkbox"/> Please charge my Deposit Account No. _____ in the amount of \$ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>03-1728</u> . A duplicate copy of this sheet is enclosed.					
<b>NOTE (2): Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.</b>					
SEND ALL CORRESPONDENCE TO					
D. Bruce Prout CHRISTIE, PARKER & HALE P.O. Box 7068 Pasadena, CA 91109-7068					
By <u>D. Bruce Prout</u> D. Bruce Prout Reg. No. 20,958					

## DESCRIPTION

COMMUNICATION GATEWAY DEVICE

## TECHNICAL FIELD

5           The present invention relates to a gateway device that interconnects two communication buses implemented with different communication methods.

## BACKGROUND ART

10           In recent years, in automobiles and other applications, two or more dissimilar communication buses, each handling unique control information, are used. When there is a need to exchange information between one communication bus and another, a gateway device is provided through which the two buses, implemented with  
15           different communication methods, are interconnected.

          When two communication buses are interconnected via a gateway device as described above, the amount of communication traffic on each communication bus increases because information on one communication bus is  
20           transmitted to the other communication bus and vice versa. To suppress such an increase in communication traffic, some prior art gateway devices employ techniques of information filtering using physical addresses or logical addresses, but in that case, information  
25           associated with the same address is all transferred to the other communication bus.

          Accordingly, with such prior art gateway devices, if only part of information is needed on the communication bus at the receiving side, all information destined for  
30           its address is processed for gatewaying into the receiving communication bus. This increases the communication traffic since unnecessary portions of the information are also transferred.

          Furthermore, in configurations where periodically  
35           occurring information is processed for gatewaying regardless of whether there occurs a change in its contents, the amount of communication traffic also

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5 DISCLOSURE OF THE INVENTION

To achieve the above object, according to the present invention, there is provided a gateway device, which interconnects two communication buses implemented with different communication methods, comprising: judging means for judging whether or not information received from one communication bus is information that should be transmitted to the other communication bus; and filtering means for transmitting the received information to the other communication bus only when the received information is judged by the judging means to be the information that should be transmitted.

BRIEF DESCRIPTION OF THE DRAWINGS

35            Figure 1 is a block diagram showing interconnections between a gateway device, according to the present invention, two communication buses connected by the

gateway device, and devices connected to the respective communication buses.

Figure 2 is a diagram showing in simplified form the format of data transmitted on each communication bus.

5        Figure 3 is a flowchart illustrating the processing steps of a service routine that a control microcomputer within the gateway device carries out when data is received.

10        Figure 4 is a diagram showing a table used to judge the contents of received data.

Figure 5 is a diagram showing a table of stored information.

15        Figure 6 is a flowchart illustrating the processing steps of a service routine that the control microcomputer within the gateway device carries out when a stored information transmission request is received.

#### BEST MODE FOR CARRYING OUT THE INVENTION

20        An embodiment of the present invention will be described below with reference to the accompanying drawings.

Figure 1 is a block diagram showing interconnections between a gateway device 10 according to the present invention, two communication buses 20 and 30 connected by the gateway device, and devices connected to the respective communication buses. The devices 21, 22, 23, 24, etc. connected to the communication bus A as the first communication bus 20 perform communications with one another in accordance with a communication protocol A (a set of communication rules) as a first communication method. Likewise, the devices 31, 32, 33, 34, etc. connected to the communication bus B as the second communication bus 30 perform communications with one another in accordance with a communication protocol B as a second communication method.

35        The gateway device 10, which interconnects the communication bus A 20 and the communication bus B 30, comprises an interface 11 for interfacing with the

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communication bus A, an interface 12 for interfacing with the communication bus B, a memory 13, and a microcomputer 14, and accomplishes the function of receiving data from one communication bus and transmitting the data to the other communication bus by performing protocol conversion.

The embodiment here specifically assumes the case in which the invention is applied to an automobile, and the communication bus A 20 is configured as a bus that uses a protocol intended for data communications between vehicle body-related control devices, while the communication bus B 30 is configured as a bus that uses a protocol intended for data communications between status information-related control devices. An engine ECU (electronic control unit) as the device 21, an air-conditioner ECU as the device 22, a meter ECU as the device 23, etc. are connected to the communication bus A 20. To the communication bus B 30 are connected a display ECU as the device 31, a navigation ECU as the device 32, an audio ECU as the device 33, etc.

Figure 2 is a diagram showing in simplified form the format of data transmitted on each communication bus. As shown in the diagram, the data consists of a header and a message, and the message is made up of a command and a parameter accompanying the command. The command is expressed by a 1-byte code. The header contains an address, an attribute, etc. The data format on the communication bus A 20 and the data format on the communication bus B 30 are fundamentally the same as that shown in Figure 2; however, the details differ between the two formats, and the conversion between them is accomplished by the gateway device 10.

Figure 3 is a flowchart illustrating the processing steps of a service routine that the control microcomputer 14 within the gateway device 10 carries out when data is received. Figures 4 and 5 are diagrams showing in schematic form the contents of tables held in the memory

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does not need gatewaying, the routine is terminated without performing processing for gatewaying. This serves to prevent the increase in traffic that would occur on the data receiving communication bus if the processing for gatewaying were performed.

If it is judged in step 102 that the command is a command, such as the outside temperature display command, that should be gatewayed only when there is a change in data contents, the process proceeds to step 104. In step 104, a table such as shown in Figure 5 is referenced. This table stores the latest data of information that should be stored. In step 104, the outside temperature data stored in the table, for example, is compared with the value of the outside temperature expressed by the currently received outside temperature display command, to determine whether there is a change in the contents. If it is determined that there is no change, the routine is terminated without performing processing for gatewaying. In this case also, the increase in traffic that would occur on the data receiving communication bus if the processing for gatewaying were performed can be prevented. On the other hand, if it is determined in step 104 that there is a change, the process proceeds to step 108 where the contents of the currently received data are stored as the latest data in the corresponding area of the table of Figure 5. Then, the process proceeds to step 110 to perform processing for gatewaying.

If it is judged in step 102 that the contents of the data show information, such as the distance-to-empty display command or the instantaneous fuel economy display command, that should be gatewayed as it is received, the process proceeds to step 106. In step 106, it is judged whether the received data carries information that should always be output via the gateway upon a request from the communication bus. A stored flag column in the table of Figure 4 is reference for this judgement. For example, a



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information, but the gateway information can be acquired from the gateway device any time.

5 Trial calculations were made to see how much the increase in traffic can be suppressed when the present invention is employed. First, it was assumed that the communication bus A has a transfer speed of 10 kbps, and that the bus usage by itself is 60% and the maximum allowable bus usage is set to 90%. It was also assumed that the communication bus B has a transfer speed of 17  
10 kbps, and that the bus usage by itself is 30% and the maximum allowable bus usage is set to 40%.

Considering the case where the communication buses A and B are interconnected and gatewaying is performed from the communication bus A to the communication bus B, it is  
15 assumed that the gatewaying entails a factor of 1.7 increase in loss because of the addition of additional information, etc. associated with protocol conversion.

Supposing that 20% of the information on the communication bus A flows into the communication bus B by the gatewaying of the prior art, the bus usage on the  
20 communication bus B rises to

$$30\% + 60\% \times 20\% \times 1.7 = 50.4\%$$

and thus cannot be held within the maximum allowable bus usage 40% for the communication bus B.

25 On the other hand, supposing that the percentage of the information on the communication bus A that flows into the communication bus B is held down to 5% because of the filtering effect of the gateway device according to the present invention, the bus usage on the  
30 communication bus B is then

$$30\% + 60\% \times 5\% \times 1.7 = 35.1\%$$

and can thus be held below the maximum allowable bus usage 40% for the communication bus B.

35 As described above, according to the present invention, by processing only really necessary information for gatewaying, it becomes possible to

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prevent unnecessary increases in communication traffic on the communication bus to which the data is sent through the gateway.

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1. (Amended) A gateway device which interconnects two communication buses implemented with different communication methods, and in which information to be communicated is made up of a header field containing information such as an address necessary for communication and a message field containing information to be used at receiving side after the communication based on said header field is completed, said gateway device comprising:

15 communication bus; and

2. (Amended) A gateway device which interconnects two communication buses implemented with different communication methods, and in which information to be communicated is made up of a header field containing information such as an address necessary for communication and a message field containing a command and a parameter accompanying said command, said gateway device comprising:

30 communication bus is information that should be  
transmitted to the other communication bus; and

filtering means for transmitting said  
received information to said other communication bus when  
said received information is judged by said judging means  
35 to be the information that should be transmitted.

3. (Amended) A gateway device which interconnects two communication buses implemented with different

communication methods, comprising:

judging means for judging whether or not  
information received from one communication bus is  
information that should be transmitted to the other  
5 communication bus;

storage means for storing the information  
that is judged by said judging means to be the  
information that should be transmitted; and

filtering means for comparing the  
10 information stored in said storage means with newly  
received information which is of the same kind as said  
stored information and is judged by said judging means to  
be the information that should be transmitted and, when  
their contents differ, transmitting said received  
15 information to said other communication bus while, at the  
same time, storing said received information in said  
storage means.

4. A gateway device as claimed in claim 3, further  
comprising:

20 means for transmitting the information  
stored in said storage means to said communication bus in  
accordance with a request made from said communication  
bus.

5. A gateway device as claimed in any one of

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claims 1 to 4, wherein said gateway device interconnects two communication buses in an automobile.

6. (Amended) A method of gatewaying in a gateway device which interconnects two communication buses  
5 implemented with different communication methods, and in which information to be communicated is made up of a header field containing information such as an address necessary for communication and a message field containing information to be used at receiving side after  
10 the communication based on said header field is completed, said method of gatewaying comprising the steps of:

(a) judging, based on contents of the message field of said communication data, whether or not the  
15 information received from one communication bus is the information that should be transmitted to the other communication bus; and

(b) performing filtering to transmit said received information to said other communication bus when  
20 in said step (a) said received information is judged to be the information that should be transmitted.

7. (Amended) A method of gatewaying in a gateway device which interconnects two communication buses implemented with different communication methods, and in  
25 which information to be communicated is made up of a header field containing information such as an address necessary for communication and a message field containing a command and a parameter accompanying said command, said method of gatewaying comprising the steps  
30 of:

(a) judging, based on the command contained in the message field of said communication data, whether or not the information received from one communication bus is the information that should be transmitted to the  
35 other communication bus; and

(b) performing filtering to transmit said

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received information to said other communication bus when in said step (a) said received information is judged to be the information that should be transmitted.

5 8. (Amended) A method of gatewaying in a gateway device which interconnects two communication buses implemented with different communication methods, comprising the steps of:

10 (a) judging whether or not information received from one communication bus is information that should be transmitted to the other communication bus;

(b) storing the information that is judged in said step (a) to be the information that should be transmitted; and

15 (c) performing filtering whereby the information stored in said step (b) is compared with newly received information which is of the same kind as said stored information and is judged in said step (a) to be the information that should be transmitted and, when their contents differ, said received information is  
20 transmitted to said other communication bus while, at the same time, storing said received information in said step (b).

9. (Amended) A method of gatewaying as claimed in claim 8, further comprising the step of:

25 (d) transmitting the information stored in said step (b) to said communication bus in accordance with a request made from said communication bus.

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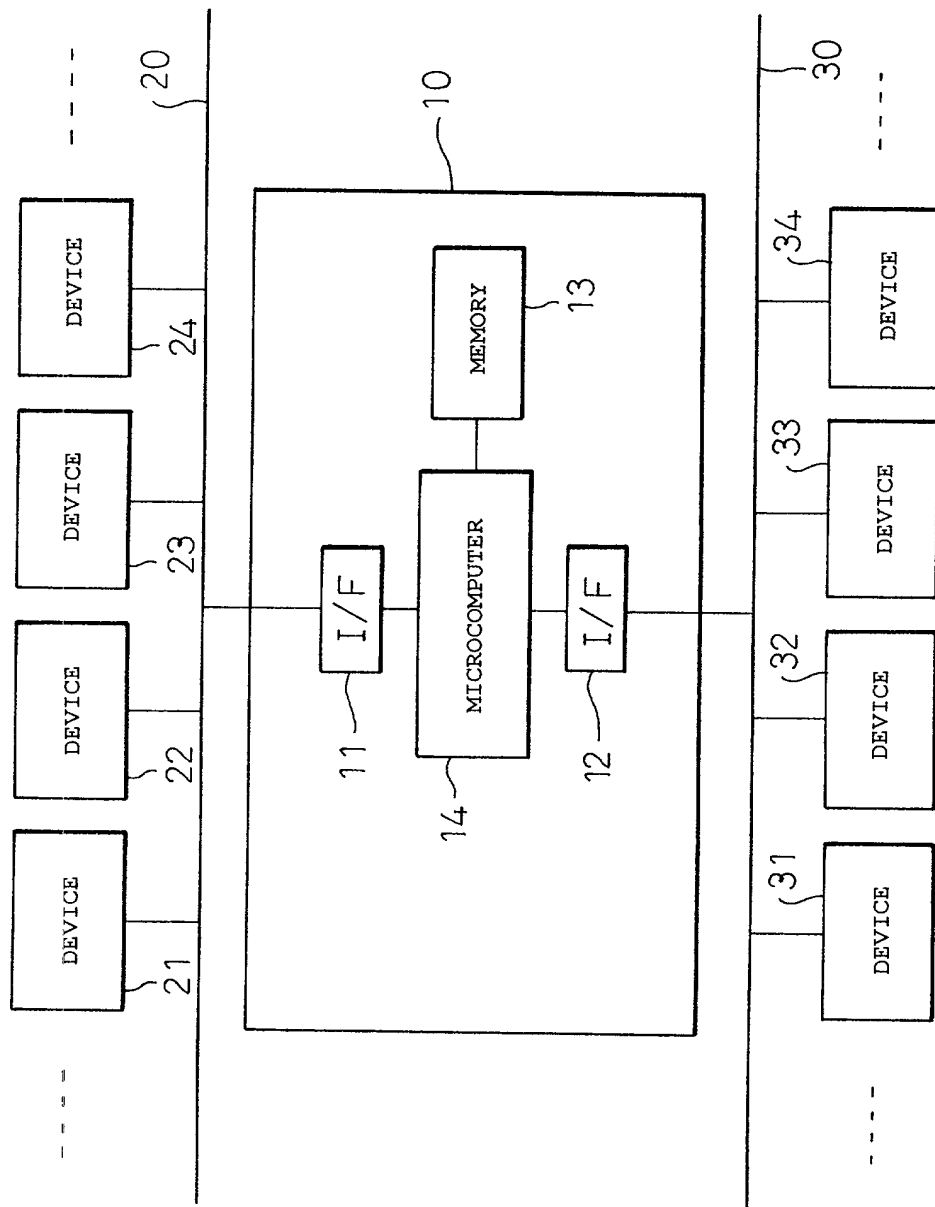
ABSTRACT

5 A gateway device is disclosed which processes only  
really necessary information for gatewaying and thereby  
prevents unnecessary increases in communication traffic  
on a communication bus to which data is sent through the  
gatewaying. When it is judged that the contents of  
received data concern a command that does not need  
gatewaying, the processing for gatewaying is inhibited.  
10 When it is judged that the contents of the received data  
show information that should be processed for gatewaying  
only when there is a change in the contents, the contents  
are compared with the latest contents of the same kind of  
information stored in a memory, to determine whether  
15 there is a change in the contents, and the processing for  
gatewaying is inhibited when it is determined that there  
is no change.

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Fig.1



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Fig. 2

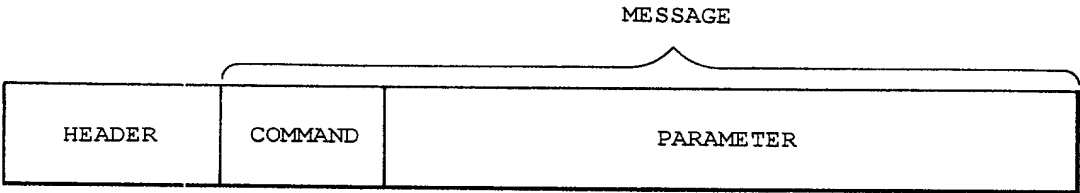


Fig. 3

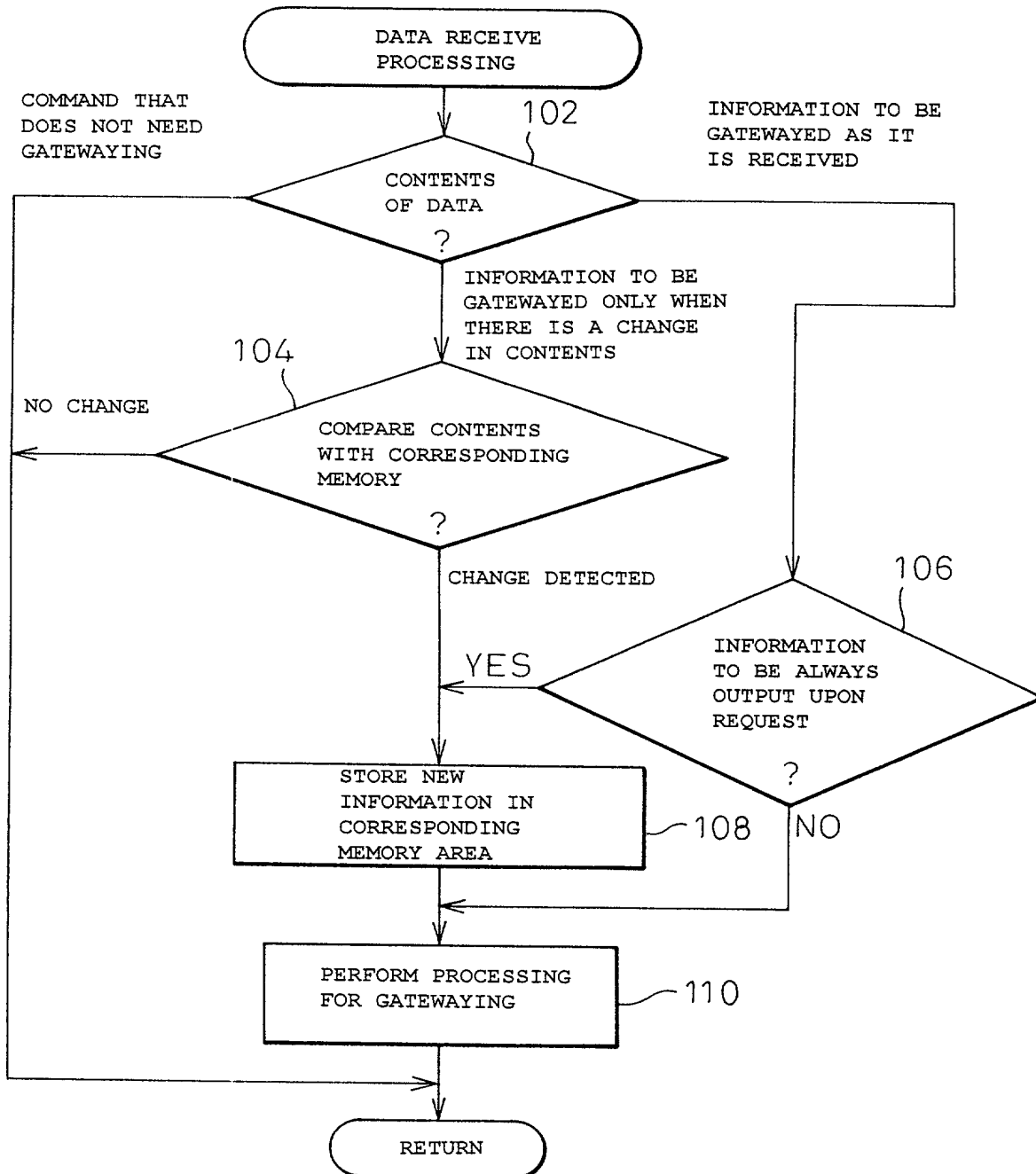


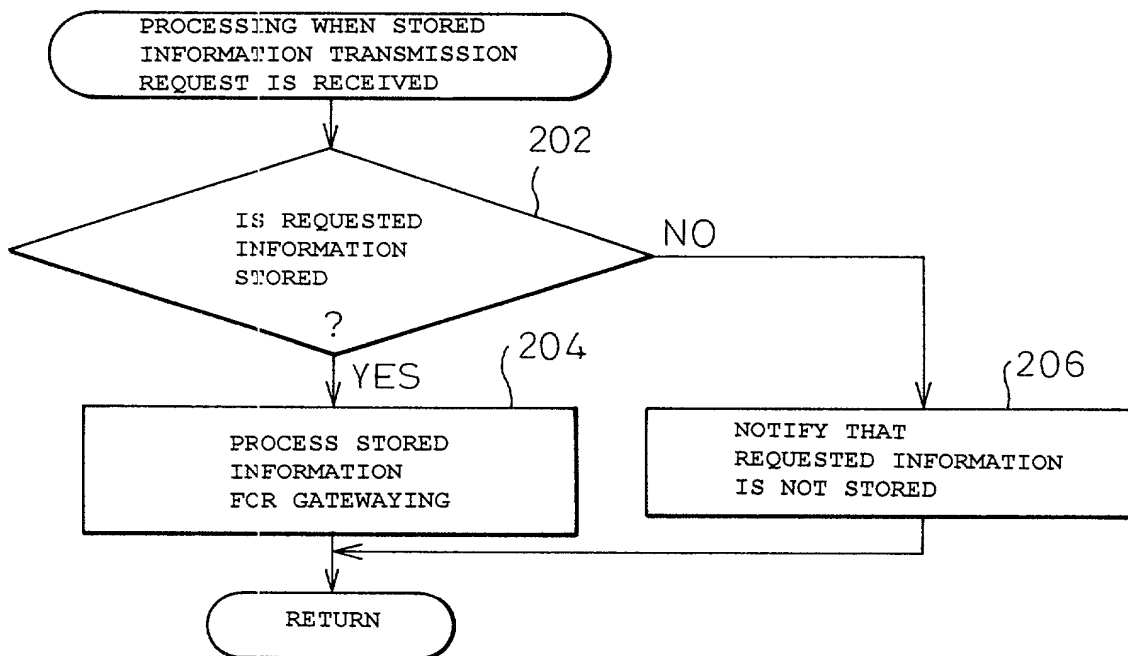
Fig.4

COMMAND CODE (HEX)	COMMAND TYPE	STORED FLAG
⋮	⋮	⋮
"05" (OUTSIDE TEMPERATURE)	1	1
⋮	⋮	⋮
"1F" (ENGINE RPM)	0	0
⋮	⋮	⋮
"B3" (DISTANCE-TO-EMPTY)	2	1
⋮	⋮	⋮
"DE" (INSTANTANEOUS FUEL ECONOMY)	2	0
⋮	⋮	⋮

Fig. 5

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OUTSIDE TEMPERATURE DATA
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DISTANCE-TO-EMPTY DATA
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Fig. 6



## Declaration and Power of Attorney For Patent Application

### 特許出願宣言書及び委任状

### Japanese Language Declaration

### 日本語宣言書

下記の氏名の発明者として、私は以下の通り宣言します。

As a below named inventor, I hereby declare that:

私の住所、私書箱、国籍は下記の私の氏名の後に記載された通りです。

My residence, post office address and citizenship are as stated next to my name.

下記の名称の発明に関して請求範囲に記載され、特許出願している発明内容について、私が最初かつ唯一の発明者（下記の氏名が一つの場合）もしくは最初かつ共同発明者である（下記の名称が複数の場合）信じています。

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

COMMUNICATION GATEWAY DEVICE

上記発明の明細書（下記の欄で×印がついていない場合は、本書に添付）は、

the specification of which is attached hereto unless the following box is checked:

☐ 月 日に提出され、米国出願番号または特許協定条約国際出願番号を \_\_\_\_\_ とし、  
(該当する場合) \_\_\_\_\_ に訂正されました。

☐ was filed on October 19, 1998  
as United States Application Number or  
PCT International Application Number  
PCT/JP98/04702 and was amended on  
August 27, 1999 (if applicable).  
(Under PCT Art. 34)

私は、特許請求範囲を含む上記訂正後の明細書を検討し、内容を理解していることをここに表明します。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第37編第1条56項に定義されるとおり、特許資格の有無について重要な情報を開示する義務があることを認めます。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

## Japanese Language Declaration (日本語宣言書)

私は、米国法典第35編119条(a)-(d)項又は365条(b)項に基づき下記の、米国外の国の少なくとも一カ国を指定している特許協力条約365(a)項に基づき国際出願、又は外国での特許出願もしくは発明者証の出願についての外国優先権をここに主張するとともに、優先権を主張している、本出願の前に出願された特許または発明者証の外国出願を以下に、枠内をマークすることで、示しています。

### Prior Foreign Application(s)

外国での先行出願

9-292909(Pat. Appln.)

Japan

(Number)

(番号)

(Country)

(国名)

(Number)

(番号)

(Country)

(国名)

I hereby claim foreign priority under Title 35, United States Code, Section 119 (a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application having a filing date before that of the application on which priority is claimed.

Priority Not Claimed

優先権主張なし

24/October/1997

(Day/Month/Year Filed)

(出願年月日)

(Day/Month/Year Filed)

(出願年月日)

私は、第35編米国法典119条(e)項に基づいて下記の米国外の特許出願規定に記載された権利をここに主張いたします。

(Application No.)

(出願番号)

(Filing Date)

(出願日)

I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.)

(出願番号)

(Filing Date)

(出願日)

私は、下記の米国法典第35編120条に基づいて下記の米国外の特許出願に記載された権利、又は米国を指定している特許協力条約365条(c)に基づき権利をここに主張します。また、本出願の各請求範囲の内容が米国法典第35編112条第1項又は特許協力条約で規定された方法で先行する米国外の特許出願に開示されていない限り、その先行米国外出願書提出日より本出願書の日本国内または特許協力条約国際提出日よりの期間中に入手された、連邦規則法典第37編1条56項で定義された特許資格の有無に関する重要な情報について開示義務があることを認識しています。

(Application No.)

(出願番号)

(Filing Date)

(出願日)

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s), or 365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code Section 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT International filing date of application.

(Status: Patented, Pending, Abandoned)

(現況: 特許許可済、係属中、放棄済)

(Application No.)

(出願番号)

(Filing Date)

(出願日)

(Status: Patented, Pending, Abandoned)

(現況: 特許許可済、係属中、放棄済)

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name and registration number)

Please see attachment

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ATTACHMENT TO PAGE 3  
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